1/16/2019

Logical Notation

$\wedge$ = AND
$\vee$ = OR
$\rightarrow$ = IF…. THEN
~ = NOT
$\leftrightarrow$ = IS THE SAME AS, or "if and only if"
$\forall$ = for all
$\exists$ = there exits
! = unique

Logical notation is related to set notation and can be paired with it.

	Set Notation		**Logical Notation**
AND	$\cap$		$\wedge$
OR	$\cup$		$\vee$
NOT	$'$		$\sim$
"IN"	$\in$	$\subset$	$\rightarrow$
EQUALS	$=$		$\leftrightarrow$

	Set Notation		**Logical Notation**
AND	intersection		conjunction
OR	Union		disjunction
NOT	complement		negation
"IN"	Is an element of	Is a subset of	conditional
EQUALS	equals		biconditional

Suppose that p = The sky is blue.
And suppose that q = The water is calm.

$\sim p$ = The sky is not blue.
$p \wedge q$ = The sky is blue and the water is calm.
$p \vee q$ = The sky is blue or the water is calm.
$p \rightarrow q$ = If the sky is blue, then the water is calm.
$p \leftrightarrow q$ = If the sky is blue, then the water is calm, and if the water is calm, then the sky is blue.
Or: The sky is blue if and only if the water is calm.

Problems #8 and 9 on the homework are like this. In one case, writing the notation in words, and in the other problem, putting a statement into notation.

$\forall x(x > 0, x \in N)$ = For all x, x is greater than 0 if x is in the set of natural numbers. (Statement is TRUE)
$\exists x(x^2 = 4)$ = There exists an x such that $x^2 = 4$. (Statement is TRUE, $x = \pm 2$)
$\exists! x(x^2 = 0)$ = There exists a unique x such that $x^2 = 0$. (Statement is TRUE, $x = 0$, and this is the only solution.)

Problem #10 is like this. Translate the notation into “English”, and then determine if the statement is true or false.

Problems #11-17 – you can try to tackle these if you like. Some of them ask you to look up information and comment on it. #17 is similar to the AxB discussion. We will talk about these more on Wednesday.